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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application]With respect to the woody product manufactured by the manufacturing method which manufactures the woody products which make various kinds of gestalten using woody raw materials, such as wood powder, a wood wafer, and wood fibers, and the manufacturing method, this invention in more detail, It is related with providing the woody product excellent in the stability of the efficient manufacturing method of woody products and shape, intensity, and dimensional accuracy.

[0002]

[Description of the Prior Art]The woody product which formed woody raw materials, such as wood powder, a wood wafer, wood fibers, cane textiles, branches and leaves, and wood sheet metal, in various kinds of gestalten, such as the shape of a board, a column, rod form, mass, or cubic shape, from the former using a small amount of adhesives without completely using adhesives is known.

[0003]The method of manufacturing woody products continuously using this kind of woody raw material is indicated by JP,11-342504,A, for example. If it is in the manufacturing method of the woody product indicated by the gazette, first, the type for manufacture is filled up with a woody raw material, and this type for manufacture is put into heating apparatus, it heats under a high-pressure-water steam, and a woody raw material is softened. Then, said type for manufacture is picked out from heating apparatus, and it sets in a compression equipment. After pushing in a presser foot part in the type for manufacture and compressing the woody raw material with which it fills up, a presser foot part is pushed in in a locking mechanism, and it locks in a position.

[0004]Subsequently, said type for manufacture is picked out from a compression equipment, and it puts into heating apparatus. After heating the woody raw material filled up with the

compression state in the type for manufacture under a high-pressure-water steam, the type for manufacture is neglected in heating apparatus in the state which has compressed the woody raw material, or it fixes by taking out from heating apparatus and cooling. Finally, the lock of said locking mechanism was canceled and the woody product which makes a desired gestalt has been obtained by removing a presser foot part and unmolding from the type for manufacture.

[0005]

[Problem(s) to be Solved by the Invention]Generally, the time which softens a woody raw material requires a long time rather than time to compress the softened woody raw material. The manufacturing method of the woody product indicated by above-mentioned JP, 11-342504,A is making the softened woody raw material shift to the following pressing operation, after performing processing which softens a woody raw material for every single type for manufacture. For this reason, softening of the woody raw material took great time, and there was a problem that the manufacturing efficiency of woody products fell.

[0006]After the above-mentioned conventional manufacturing method carried out preliminary compression of the woody raw material with which the type for manufacture was filled up and it tiered two or more types for manufacture which carried out preliminary compression, it needed to perform solidification and a drying process. Therefore, the device which raises the manufacturing efficiency of a woody product is made by performing two or more manufacturing processes for softening processing, compression processing, and fixing treatment continuously.

[0007]However, it will worsen as the heat inside [with which the type for manufacture was filled up at the time of heat-treatment] a woody raw material and the time which heat-treatment takes will not only become great, but [if preliminary compression of the woody raw material is carried out,] it broke out that the heat for heating a woody raw material is taken so much by the type for manufacture, and softening efficiency was getting worse. When tiering two or more types for manufacture and softening especially, the woody raw material was surrounded with the type for manufacture, and since the heat which heats a woody raw material was taken so much by the type for manufacture, softening efficiency was getting worse further.

[0008]By the way, a woody product tends to absorb water, swells by water absorption, and it becomes flexible, and when an opening increases inside with the swelling, intensity falls. Especially the woody product solidified by the compression state carries out the work which is going to cancel the compression form of a woody raw material, when the etholung which it is going to restore to the original state other than swelling by water being included occurs. This only leads to causes, such as exfoliation of not only the dimensional change of woody products but a woody product, and collapse.

[0009]There are the method of immersing in hot water, warm water, etc., the method of

neglecting it under a high-temperature-high-pressure steam, etc. in the softening process of the production lines which comprise a softening process like ****, a pressing operation, and a series of processes of an immobilization process. in this case -- especially -- the above-mentioned softening process or subsequent ones -- each -- it is in process, and if the moisture contained in a woody raw material is not removed to the minimum, the product strength after shaping not only falls, but it brings about deterioration of not only the appearance as a final product but quality.

[0010]And if the woody raw material used as a product object is under the condition from which a dimensional change arises very easily and does not satisfy some conditions, such as a process condition and processing time, also after it finishes each processing, after manufacture of a woody product, recovery of compression takes place and reservation of the stability of shape or a size is difficult for it.

[0011]This invention is made that this conventional technical problem should be canceled, and can attain improvement in productivity, and. It aims also at providing the woody product which was excellent in the stability of the gestalt after being produced commercially, intensity, and a size further for the purpose of providing the manufacturing method which made it possible to suppress efficiently the dimensional change produced for a woody product.

[0012]

[Means for Solving the Problem and its Function and Effect]When examination is repeated wholeheartedly that this artificer should solve an aforementioned problem, if water content of a woody raw material before producing commercially satisfies within the limits of a certain specification, Water content and a longitudinal elastic modulus of a woody product after the manufacture maintained and were stable in a proper field, and it knew that a problem would not arise on practical use as a product. Namely, when this invention dries positively a woody raw material for which it has the predetermined water content in alignment with the early purpose following compression and fixed hardening before shaping. Also after being produced commercially, even by exceeding said water content, it is lost that moisture is included, and a woody product which moreover has a proper longitudinal elastic modulus can come to satisfy a bending size based on product JIS, and where a gestalt, product strength, and a size are stabilized, it can be borne at practical use.

[0013]An invention concerning this claim 1 is an invention drawn from the above-mentioned examining result, It is a manufacturing method which manufactures a woody product which consists of woody raw materials, such as wood powder, a wood wafer, and wood fibers, A process of making into 60% or less water content of a woody raw material with which type for manufacture is filled up, a process of carrying out compression molding of the woody raw material filled in said type for manufacture, After setting a woody raw material which carried out compression molding in a pressure vessel, a high-pressure-water steam is made full in a

pressure vessel, It is said woody raw material (1) after completion of a process of carrying out predetermined time neglect and carrying out fixed hardening into atmosphere of a high-pressure-water steam, and said process of carrying out fixed hardening. A process to dry is included and it is a manufacturing method of a woody product characterized by things.

[0014]Water content to which natural seasoning of this invention manufacturing method was carried out first prepares beforehand 60% or less of woody raw material. Next, water content is pressed after carrying out specified quantity restoration of 60% or less of the woody raw material at type for manufacture. Subsequently, fixed hardening of the compressed woody raw material is carried out with a predetermined temperature and time under a high-pressure-water steam in a pressure vessel.

[0015]If water content carries out compression / fixed hardening of 60% or less of the woody raw material, the surfaces of a softened woody raw material will produce physical engagement firmly and finely, and. Wood components contained in a woody raw material, such as sap, lignin, and hemicellulose, soften and mobilize, and some wood components which obtained mobility are pressed out by compression. At this time, said wood components pressed out by compression have viscosity, and by a high-pressure-water steam's permeating an inside of a compressed woody raw material, and causing a chemical reaction (condensation), where a compressed woody raw material is stabilized dimensionally, fixed hardening is carried out.

[0016]Thus, when physical adhesion and chemical adhesion are connected organically, even if it does not use adhesives, powerful self adhesiveness and good shape stability come to be acquired. Since the viscosity etc. of wood components, such as sap contained in a woody raw material, will be insufficient and self adhesiveness and shape stability will not be acquired if water content of a woody raw material exceeds 60%, it does not get used not much practical.

[0017]From the first, since a woody raw material whose water content is 60% or less has a softened state required for compression processing, it makes unnecessary a softening process of the production lines which comprise a series of processes, such as a softening process, a pressing operation, and an immobilization process. As for the compression molding, it is preferred to compress until it becomes about about 3 / 4 to thickness of a woody raw material before compression, and it is preferred to neglect a woody raw material in the state where it compressed, for about 10 minutes in a pressure vessel in the next fixing treatment under a high-pressure-water steam (about 10.2 atmospheres and about 180 **) of temperature.

[0018]In an invention concerning claim 2, it includes opening a pressure in said pressure vessel wide, decompressing to atmospheric pressure, and drying said woody raw material within said pressure vessel after specified time elapse after completion of said process which carries out fixed hardening. In this invention, a fixed woody raw material is seasoned positively, maintaining the state where a pressure in said pressure vessel was decompressed to atmospheric pressure, after fixing a woody raw material in a necessary compression state.

Since change is produced in the physical properties of a woody raw material, after making a necessary compression state fix a woody raw material if water content made into the early purpose exceeds 60%, it is necessary to control water content of a woody raw material. Therefore, also after being produced commercially, even by exceeding said water content, changing dimensionally is lost and generating of collapse of types of products, peeling, etc. does not produce it.

[0019]In order that this invention manufacturing method may season a woody raw material within the same pressure vessel after fixing a woody raw material in a necessary compression state within a pressure vessel and also It can become possible to perform an immobilization process of a woody raw material, and a drying process after the immobilization continuously within a single pressure vessel, and manufacturing efficiency can be raised extremely.

[0020]In order that this invention manufacturing method may fill up type for manufacture with a woody raw material in the state which has the water content of 60% or less where it softened beforehand and may carry out compression molding, without softening a woody raw material for every type for manufacture single like the former, What is necessary is just to prepare beforehand many of a lot of woody raw materials rather than capacity of type for manufacture, and before carrying out specified quantity restoration at two or more types for manufacture, respectively and carrying out compression molding of the woody raw material by a necessary softened state, it is not necessary to soften a woody raw material. Therefore, it becomes possible to perform that it is simultaneous and promptly restoration of a woody raw material, and compression molding of a filled woody raw material or processing after the compression molding, and manufacturing efficiency can be extremely raised now.

[0021]An invention concerning claim 3 is characterized by setting up drying time in said pressure vessel in 3 to 60 minutes. According to this invention, after fixing a woody raw material in a necessary compression state, season a fixed woody raw material within said pressure vessel, holding a pressure in a pressure vessel to atmospheric pressure, but. In that case, it is effective to neglect a fixed woody raw material for 3 to 60 minutes in atmosphere below atmospheric pressure in said pressure vessel.

[0022]If it is in this invention, a fixed woody raw material can also be seasoned with remaining heat in said pressure vessel. If said woody raw material is seasoned using remaining heat in said pressure vessel, it becomes without needing a device used for a drying process, and space-saving-ization of a production line can be attained certainly. Fuel consumption, facility management expense, etc. which are used for a heat source, electric power, etc. can be made to reduce substantially.

[0023]An invention concerning claim 4 is a woody product which has a gestalt of a request obtained by the manufacturing method according to any one of claims 1 to 3, Water content [of the woody product] x (%) and the longitudinal elastic modulus y (MPa) $y=y_1-y_2$, $y=y_3-y_4$ --

however, $y_1 = -10.6x_1 + 670$, A relation of $y_2 = -6.8x_2 + 443$, $y_3 = -5.1x_3 + 450$, $y_4 = -2.3x_4 + 263$, $10 \leq x_1$, $x_2 \leq 40$, and $40 < x_3$ and $x_4 \leq 60$. It is characterized by being satisfied.

[0024] Here, that a woody product produced commercially has a longitudinal elastic modulus peculiar to the woody raw material in a fixed elastic limit is the matter generally known. If it was in this invention, we decided to specify character of woody products, for example by expressing character peculiar to a woody raw material using a longitudinal elastic modulus. As a result, it became clear that they would do so a function as said woody product if water content [of woody products] x (%) and a relation with the longitudinal elastic modulus y (MPa) have satisfied some specific conditions.

[0025] This invention specifies a maximum and a minimum of transition of a proper longitudinal elastic modulus behind a product which can be equal to practical use, in order for a longitudinal elastic modulus of woody products to change according to a process condition, a heat treatment condition, etc. of a woody raw material. Namely, when the water content x of woody products and a relation with the longitudinal elastic modulus y make said water content x 10 to 40% or less, A straight line produced by connecting each upper limit of the longitudinal elastic modulus y to a value of said water content x is made into $y_1 = -10.6x_1 + 670$, and a straight line produced by connecting each lower limit of the longitudinal elastic modulus y to said water content x is made into $y_2 = -6.8x_2 + 443$. However, water content x_1 of a woody product at this time, longitudinal-elastic-modulus y_1 corresponding to x_2 , and y_2 must be in $10 \leq x_1$ and a field surrounded between $x_2 \leq 40$.

[0026] Preferably, about 10% of the minimum of the water content x of woody products is desirable. If this water content x decreases rather than 10%, in order to exceed within the limits of the longitudinal elastic modulus y of a woody product made into the purpose in early stages of this invention, product strength falls, and it becomes easy to produce destruction, breakage, etc. of a woody product, and does not get used not much practical.

[0027] When making water content x of woody products into 40 to 60%, a straight line produced by connecting each upper limit of the longitudinal elastic modulus y to a value of the water content x is made into $y_3 = -5.1x_3 + 450$, A straight line produced by connecting each lower limit of the longitudinal elastic modulus y to a value of said water content x is made into $y_4 = -2.3x_4 + 263$. However, water content x_3 of a woody product at this time, longitudinal-elastic-modulus y_3 corresponding to x_4 , and y_4 must be in $40 < x_3$ and a field surrounded between $x_4 \leq 60$. If said water content x_3 and x_4 increase rather than 60%, since product strength falls as mentioned above, it is not desirable.

[0028] Shape, structure, and raw material of common knowledge widely known from the former

can be used for a woody product made into an object of this invention. In order to press down a woody raw material whose water content is 60% or less from the first to 60% or less and to stabilize dimensionally water content of a woody raw material before shaping according to an above-mentioned pressing operation, an immobilization process, and a drying process, said longitudinal elastic modulus y is controlled in said field. Even if it is under a condition of everythings, such as a process condition and processing time, it not only comes to satisfy a bending size based on product JIS, but the optimal longitudinal elastic modulus y corresponding to water content of a woody raw material is obtained effectively. Collapse of woody products, peeling, etc. after shaping can be prevented, and product quality can be raised, without reducing product value.

[0029]

[Embodiment of the Invention] Hereafter, the suitable embodiment of this invention is concretely described based on an accompanying drawing. The approximate account figure showing an example of a process which manufactures the woody product whose drawing 1 is a typical embodiment of this invention, and drawing 2 are the approximate account figures showing an example of the next process of drawing 1. The woody product made into the object of this invention consists of woody raw materials, such as wood powder, a wood wafer, wood fibers, cane textiles, branches and leaves, and wood sheet metal, for example, and continuous molding of it is carried out to various kinds of gestalten, such as the shape of a board, a column, rod form, mass, or cubic shape, without using adhesives.

[0030] When the water content of the woody raw material before shaping which is a feature section of this invention and which carried out natural seasoning is 60% or less, the woody product which consists of this composition, Under the various process conditions which comprise a pressing operation which makes the softening process of a woody raw material unnecessary, and compresses a woody raw material to mention later, an immobilization process fixed under a high-temperature-high-pressure steam, etc., water content maintains 60% or less. And the woody product after shaping has the optimal longitudinal elastic modulus, and satisfies the bending size based on product JIS. For this reason, where shape, product strength, and dimensional accuracy are stabilized, it can be equal to practical use. This characteristic is not limited to the above-mentioned gestalt or construction material of woody products, and does not change at all according to the well-known gestalt or construction material which were widely known from the former.

[0031] If the water content under said each process condition is 60% or less, the woody product made into the object of this invention, The softened woody raw materials can be made to produce physical engagement firmly and finely by the above-mentioned compression processing and fixing treatment now. Wood components with viscosity contained in the mobilized woody raw material, such as sap, lignin, and hemicellulose, can be made to

condense effectively. For this reason, powerful self adhesiveness and good shape stability come to be acquired by the woody raw material itself, and collapse, exfoliation, etc. of a woody product which interfere with practical use can be prevented. If the water content in a woody raw material exceeds 60%, since the viscosity etc. of wood components, such as sap contained in a woody raw material, are insufficient and shape stability required as a product etc. are not acquired, it is not desirable practically.

[0032]The woody product of this invention with the above-mentioned composition is efficiently manufactured as follows following the compression except softening of a woody raw material, and continuous shaping of immobilization by the manufacturing method of this invention dried in the decompressed atmosphere under atmospheric pressure. If it is in the manufacturing method concerning following embodiments, the buster board which makes tabular is mentioned as an example, and is explained.

[0033]The manufacturing method concerning this embodiment seasons a woody raw material within the same pressure vessel, after fixing a woody raw material in a necessary compression state within the pressure vessel under a high-pressure-water steam, but. Naturally it also includes that this invention carries out fixed hardening by taking out from the inside of a pressure vessel and cooling in the state which has compressed the woody raw material after not being limited to this and fixing a woody raw material in a necessary compression state, for example within the pressure vessel under a high-pressure-water steam.

[0034]According to this invention manufacturing method, first, the water content which carried out natural seasoning feeds 60% or less of woody raw material into the storage hopper 3 shown in drawing 3, and stores it beforehand. Since the woody raw material whose water content is 60% or less from the first has a softened state required for compression processing, it makes unnecessary the softening process of the production lines which comprise a series of processes, such as a softening process, a pressing operation, and an immobilization process.

[0035]Drawing 3 shows the storage hopper 3, and measuring and a filling machine 4. As for 60% or less of woody raw material 1, the water content supplied to the storage hopper 3 is conveyed by driving the screw conveyor 5 which is a transportation means to measuring and the filling machine 4. Type 2 for manufacture is laid on the stand 4a of the said measuring and the filling machine 4. where the slide damper 4c which opens and closes the lower aperture of the measuring measure 4b which makes the box shape which carried out the opening is closed, the upper surface and the undersurface drive the screw conveyor 5, and throw in said woody raw material 1 in the measuring measure 4b at a heap. the woody raw material 1 is measured by cutting by rubbing and carrying out a bowlful of woody raw material 1, and making it flat-tapped with the upper surface of the measuring measure 4b. next, said slide damper 4c is slid to an open position, and it is filled up with the woody raw material 1 in the measuring measure 4b in type 2 for manufacture. The state where it was filled up with the

woody raw material 1 in type 2 for manufacture is shown in drawing 1 (a).

[0036]The bottom part 2a which makes the core box of the long and slender rectangular shape in which the upper surface carried out the opening as said type 2 for manufacture is shown in drawing 1 and drawing 4, Cope box 2b which makes the long and slender rectangular frame shape in which the upper and lower sides allotted to the inside of the bottom part 2a enabling free insertion and detachment carried out the opening, It is constituted by the long and slender pin 2e for a lock allotted to pin hole 2b-1 of the bottom plate 2c which makes tabular [which is allotted to the pars basilaris ossis occipitalis of said bottom part 2a / long and slender], the pushing plate 2d which presses the woody raw material 1 with which it filled up, and the couple formed in the both-sides side wall part of said bottom part 2a, and 2b-1 enabling free insertion and detachment. Hole 2a-1 for unmolding is formed in the pars basilaris ossis occipitalis of said bottom part 2a. Hole 2a-1 for the said unmolding is closed by said bottom plate 2c. Said pushing plate 2d is making the approximately identical shape formed heavy-gage rather than said bottom plate 2c, and is locked by said pin 2e for a lock by the compression position in said bottom part 2a.

[0037]After filling up type 2 for manufacture with the woody raw material 1 of requirements now, type 2 for manufacture is taken out from the stand 4a of measuring and the filling machine 4. After taking out type 2 for manufacture, as shown in drawing 1 (b) and drawing 4, said pushing plate 2d is laid on the woody raw material 1 with which it filled up in type 2 for manufacture, and type 2 for manufacture filled up with the woody raw material 1 is conveyed and set to the compressor 6.

[0038]Said compressor 6 is constituted by the pressing machine provided with the press head 6a so that rise and fall were possible as shown in drawing 1 (c) and drawing 5. The rod end of the press head 6a is dropped, the upper surface of the pushing plate 2d of type 2 for manufacture is pressed, and the woody raw material 1 in the bottom part 2a is compressed. In that case, it is preferred to compress until it becomes about about 3 / 4 to the thickness of the woody raw material 1 before compression. After said pushing plate 2d descends until it enters in the bottom part 2a as shown in drawing 6, The rod end of the cylinder 6b for rise and fall is made to engage with hook piece 2b-2 formed in the upper bed edge of cope box 2b in type 2 for manufacture at frame shape, and said cope box 2b is moved upwards by going up the cylinder 6b for the said rise and fall.

[0039]Thus, in order to fill up type 2 for manufacture with the woody raw material 1 which has the water content of 60% or less and to carry out compression molding, without softening the woody raw material 1 for every single type 2 for manufacture, What is necessary is just to prepare beforehand many of a lot of woody raw materials 1 rather than the capacity of type 2 for manufacture, and while carrying out specified quantity restoration two or more type 2 for manufacture, respectively and carrying out compression molding of the woody raw material 1

by a necessary softened state, the work which softens the following woody raw material 1 can be excluded, and manufacturing efficiency can be raised extremely.

[0040]After moving cope box 2b of type 2 for manufacture upwards, along with slot 6a-1 which carried out the opening to the side part of pin hole 2b-1 of the bottom part 2a, and the press head 6a, the pin 2e for a lock of type 2 for manufacture is inserted, and said pushing plate 2d is locked in a compression position. The woody raw material 1 is locked in the state of said bottom plate 2c and the pushing plate 2d where did and it was compressed into the bottom part 2a, as shown in drawing 6. After the end of a lock, said cylinder 6b for rise and fall is dropped, and said cope box 2b is laid on said pin 2e for a lock. Even if it cancels the pushing force by locking said pushing plate 2d, the woody raw material 1 does not change elastic restoration into the original state.

[0041]After locking said pushing plate 2d in a compression position, type 2 for manufacture filled up with the woody raw material 1 is taken out from the compressor 6, the cope box which is not illustrated outside carries out it, and it conveys to an opportunity. Besides outside the limit is carried out and said cope box 2b is removed from said bottom part 2a by an opportunity. The state where said cope box 2b was removed from the bottom part 2a is shown in drawing 1 (d). Next, after cope box outside's carrying out said bottom part 2a and the pushing plate 2d and taking them out from an opportunity, said bottom part 2a is tiered to two or more steps using the tiering machine which is not illustrated. The state where two or more bottom parts 2a were tiered is shown in drawing 1 (e) and drawing 7.

[0042]Next, two or more tiered bottom parts 2a are conveyed to the fixed furnace 7. The state where two or more bottom parts 2a tiered to drawing 2 (a) and drawing 8 were stored at the fixed furnace 7 is shown. The fixed furnace 7 is constituted by the pressure vessel 7a. The lid which is not illustrated is formed in the longitudinal direction both ends of the pressure vessel 7a of the fixed furnace 7, enabling respectively free attachment and detachment. Said fixed furnace 7 is connected to the boiler which supplies a high-pressure-water steam in the pressure vessel 7a and which is not illustrated, and the vacuum pump which decompress the inside of the pressure vessel 7a below to atmospheric pressure and which similarly is not illustrated.

[0043]After the set of two or more bottom parts 2a is completed, it solidifies, where it supplied the high-pressure-water steam in the pressure vessel 7a and the woody raw material 1 is compressed. At this time, it is preferred to neglect the woody raw material 1 in the state where it compressed, for about 10 minutes in the pressure vessel 7a under the high-pressure-water steam (about 10.2 atmospheres and about 180 **) of temperature.

[0044]After carrying out fixed hardening of the woody raw material 1 within said pressure vessel 7a at a necessary compression state, the pressure in the same pressure vessel 7a is decompressed below to atmospheric pressure. The fixed woody raw material 1 is positively

seasoned with the remaining heat in said pressure vessel 7a, maintaining the inside of the pressure vessel 7a at the pressure below atmospheric pressure, as shown in drawing 2 (a). In that case, it is preferred to neglect the fixed woody raw material 1 for 3 to 60 minutes in the atmosphere below the atmospheric pressure in said pressure vessel 7a.

[0045] Thus, since the woody raw material 1 is seasoned within the same pressure vessel 7a, the immobilization process of the woody raw material 1 and the drying process after the immobilization can be continuously performed now within the single pressure vessel 7a, and manufacturing efficiency can be improved efficiently. If the woody raw material 1 is seasoned using the remaining heat in said pressure vessel 7a, it becomes without needing the device used for a drying process, and space-saving-ization of a production line can be attained certainly. Fuel consumption, facility management expense, etc. which are used for a heat source, electric power, etc. can be made to reduce substantially.

[0046] After seasoning the fixed woody raw material 1, the pin 2e for a lock of type 2 for manufacture is extracted for the woody raw material 1 from the bottom part 2a with the lock release machine 8, and the locked position of the pushing plate 2d is canceled. An unmolding state is shown in drawing 2 (c) and drawing 9. It is conveyed by every bottom part 2a at the lock release machine 8, and a locked position is canceled by drawing out said pin 2e for a lock. By [which go up and down in a cylinder etc.] pushing up and raising the plate 8a, the push rod 9 is inserted in hole 2a-1 for unmolding of the bottom part 2a, and said bottom plate 2b, the woody product 10, and the pushing plate 2d are simultaneously unmolded from the bottom part 2a. The pushing plate 2d is changed into a dismountable state from the bottom part 2a. Next, it conveys to the unmolding machine which does not illustrate the bottom part 2a of which the locked position was canceled. The woody products 10 and the pushing plate 2d are unmolded from the bottom part 2a with an unmolding machine.

[0047] Next, it conveys to the product tripper which does not illustrate the both sides of the woody product 10 unmolded from the bottom part 2a, and the bottom plate 2c. By a product tripper, only the woody product 10 is accumulated, as shown in drawing 2 (d) and drawing 10. In this way, the woody product 10 of the desired number made into the object of this invention can manufacture efficiently and promptly by repeating the above-mentioned operation successively.

[0048] Generally it is known like the above that the manufactured woody product 10 has a longitudinal elastic modulus peculiar to the woody raw material in a fixed elastic limit. The character of the woody product 10 can be specified by expressing character peculiar to this woody raw material using a longitudinal elastic modulus. That is, if the relation of x (%) and the longitudinal elastic modulus y (MPa) of the woody products 10 has satisfied following formula ** and **, it can prevent collapse of the woody product 10, peeling, etc., and it can raise product quality, without reducing product value.

[0049]

$y=y_1-y_2$ —** $y=y_3-y_4$ —** It corrects, $y_1=-10.6x_1+670$, $y_2=-6.8x_2+443$, $y_3=-5.1x_3+450$ and $y_4=-2.3x_4+263$ $10 \leq x_1$, $x_2 \leq 40$, and $40 < x_3$ and $x_4 \leq 60$ drawing 11 correlation with the longitudinal elastic modulus of the woody products 10 and water content in this invention. The graph shows. In the figure, the graph shown as two solid lines shows change of the longitudinal elastic modulus y to the woody products 10 which have the water content x of 60% or less, respectively. The result is plotted by O and ** on a graph.

[0050]When said water content x_1 and x_2 change to 10 to 40% so that clearly from the figure, the upper limit of longitudinal-elastic-modulus y_1 gradually decreases linearly to 564 - 246MPa. Straight-line y_1 produced by connecting the upper limit 564 of these elastic coefficient y_1 - 246MPa can understand becoming $y_1=-10.6x_1+670$. On the other hand, it turns out that the lower limit of longitudinal-elastic-modulus y_2 is linearly dwindled to 375 - 171MPa, and straight-line y_2 produced by connecting the lower limit 375 of these elastic coefficient y_2 - 171MPa turns into $y_2=-6.8x_2+443$.

[0051]Therefore, when making said water content x_1 and x_2 into 10 to 40%, If it is in said each straight-line $y_1=-10.6x_1+670$ and $y_2=-6.8x_2+443$, and said water content $10 \leq x_1$ and the field D1 surrounded between $x_2 \leq 40$, Within the limits of longitudinal-elastic-modulus y_1 of the woody product 10 made into the purpose in early stages of this invention and y_2 is maintained and stabilized. If water content x_1 of the woody product 10 which is the purpose in early stages of this invention, and x_2 decrease rather than 10%, in order to exceed within the limits of longitudinal-elastic-modulus y_1 of this woody product 10, and y_2 , product strength falls and it becomes easy to produce destruction, breakage, etc. of the woody product 10.

[0052]When said water content x_3 and x_4 change to 40 to 60%, The upper limit of said longitudinal-elastic-modulus y_3 is linearly dwindled to 246 - 144MPa, and it turns out that straight-line y_3 produced by connecting the upper limit 246 of these elastic coefficient y_3 - 144MPa turns into $y_3=-5.1x_3+450$. This straight-line y_3 has inclination looser than above-mentioned straight-line $y_1=-10.6x_1+670$. On the other hand, the lower limit of said longitudinal-elastic-modulus y_4 , It has inclination looser than above-mentioned straight-line y_2 , and he gradually decreases linearly to 171 - 125MPa, and can understand that straight-line y_4 produced by connecting the lower limit 171 of these elastic coefficient y_4 - 125MPa turns into

$$y_4 = -2.3x_4 + 263.$$

[0053]Therefore, when making said water content x_3 and x_4 into 40 to 60%, In order to stop longitudinal-elastic-modulus y_3 of the woody product 10 which is the purpose in early stages of this invention, and y_4 within the optimal limits, Said each straight-line $y_3 = -5.1x_3 + 450$ and $y_4 = -2.3x_4 + 263$, What is necessary is just to be in said water content $40 < x_3$ and field D2 surrounded between $x_4 \leq 60$, and he can understand maintaining and stabilizing within the limits of longitudinal-elastic-modulus y_3 of the woody product 10 made into the purpose in early stages of this invention, and y_4 . Since said water content x_3 and x_4 will increase rather than 60% if upper limit 144MPa of said longitudinal-elastic-modulus y_3 and lower limit 125MPa of longitudinal-elastic-modulus y_4 are exceeded, Product strength falls, and it becomes easy to produce collapse, breakage, etc. of the woody product 10, and does not get used not much practical.

[0054]Thus, the woody raw material 1 whose water content is 60% or less from the first, Since the water content x of the woody product 10 is stopped to 60% or less and an above-mentioned pressing operation, immobilization process, and drying process are dimensionally stable, Even if it is under the condition of everythings, such as a process condition of the woody raw material 1, and a heat treatment condition, the woody products 10 which it not only comes to satisfy the bending size based on product JIS, but have the optimal longitudinal elastic modulus y corresponding to the water content x are obtained effectively.

[Translation done.]